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Kojima

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(54) **CONNECTOR**

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H01R 13/52 (2006.01)

H01R 13/447 (2006.01)

(52) **U.S. Cl.**

CPC **H01R 13/5213** (2013.01); **H01R 13/447** (2013.01)

(58) **Field of Classification Search**

CPC H01R 2201/26; H01R 13/447; H01R 13/6397; H01R 13/5213; H01R 13/516

USPC 439/131, 142

See application file for complete search history.

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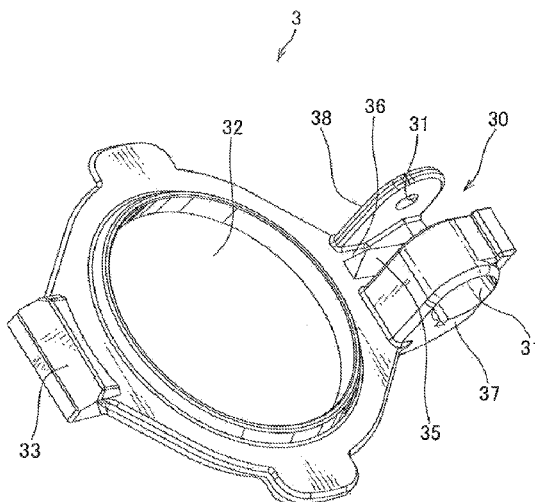
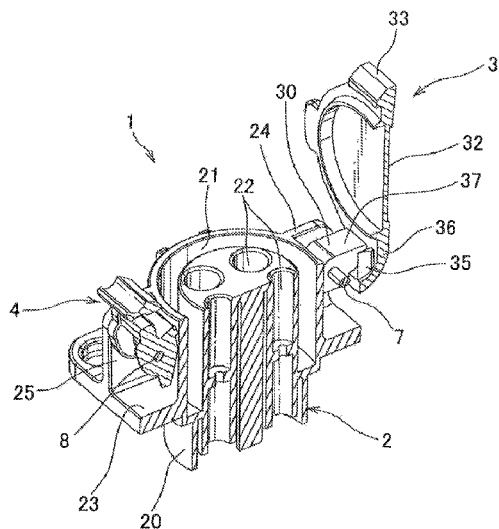
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(57) **ABSTRACT**

Provided is a connector in which a cover is readily closed when ice is induced between a pair of shaft attachment plates by such snowfall. A connector mounted in an electric vehicle and connected to a connector of a charge cable is provided with a housing, a cover rotatably pivoted by the housing and covering an opening of the housing, a latch, and shafts. The cover is provided with a pair of shaft attachment plates and a rib arranged between the pair of shaft attachment plates. The rib extends in a direction perpendicular to a direction of the pair of shaft attachment plates being opposed to each other, and formed such that its tip is peaked. In the connector, even when ice is induced, rotation of the cover in closing direction allows the ice to be broken by the rib so as to readily close the cover.

2 Claims, 8 Drawing Sheets



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FIG. 1

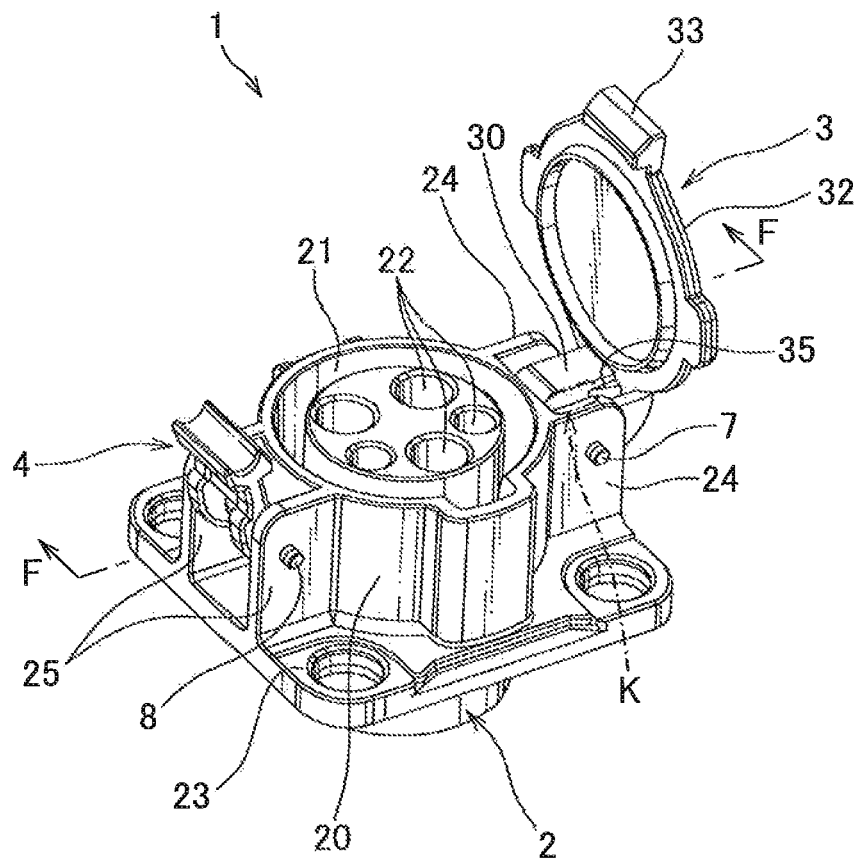


FIG. 2

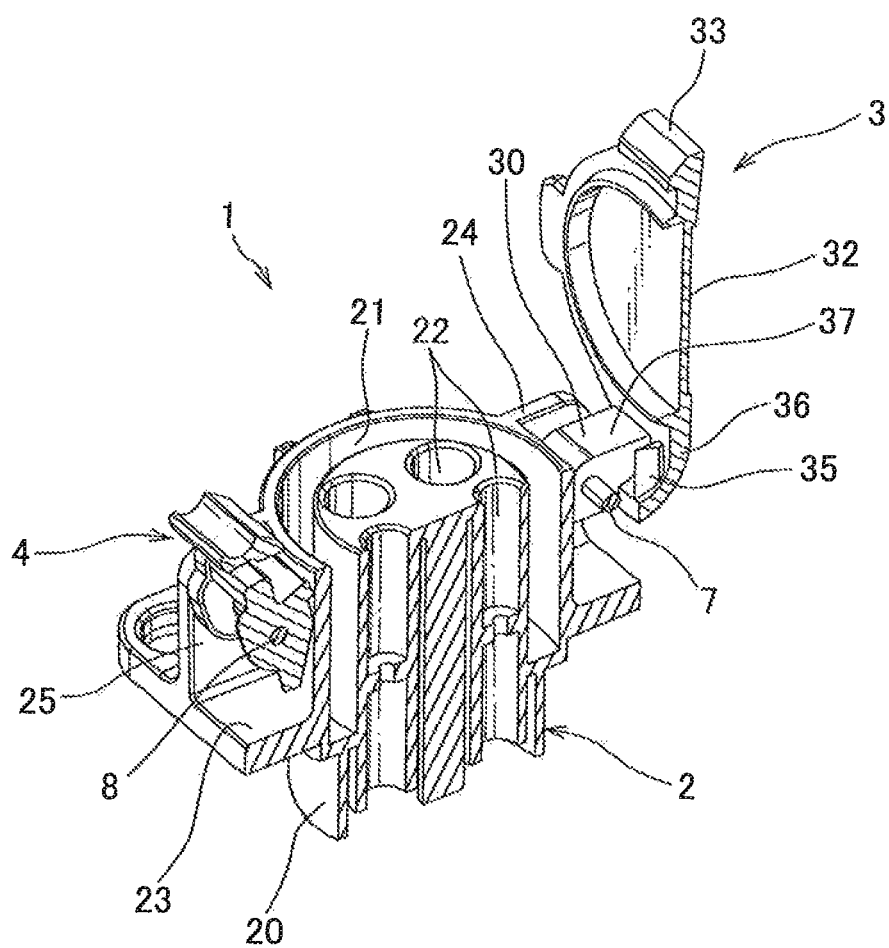


FIG. 3

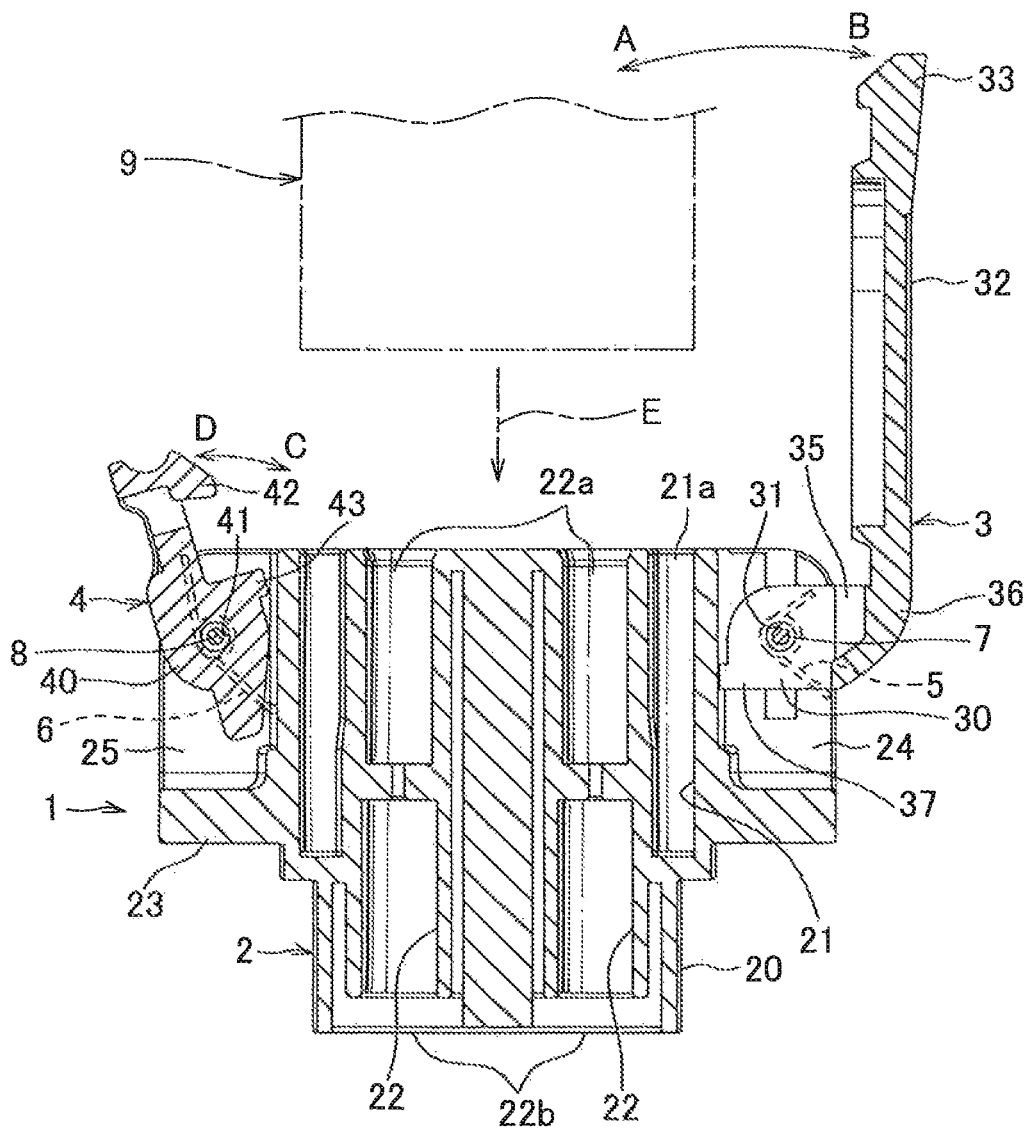


FIG. 4

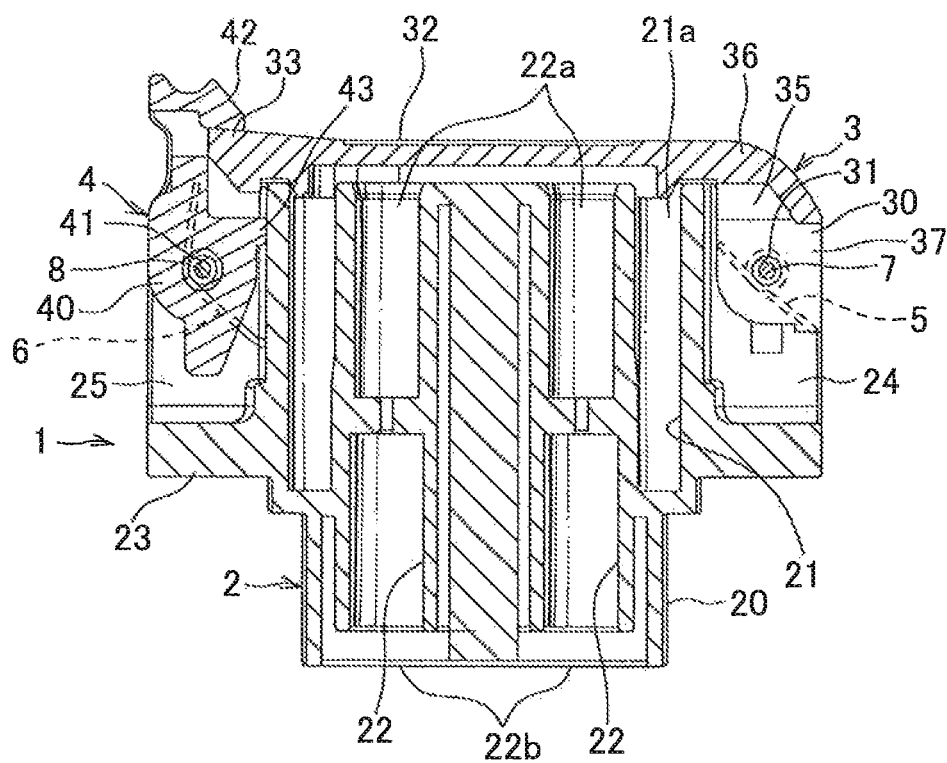


FIG. 5

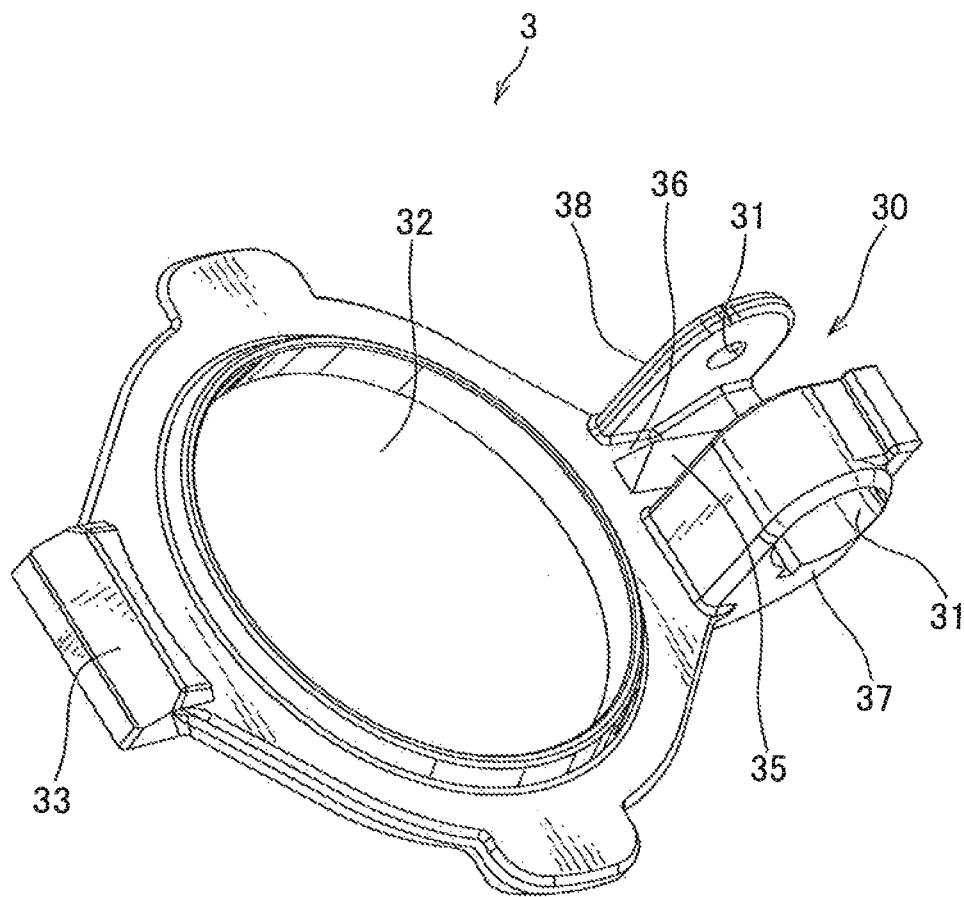
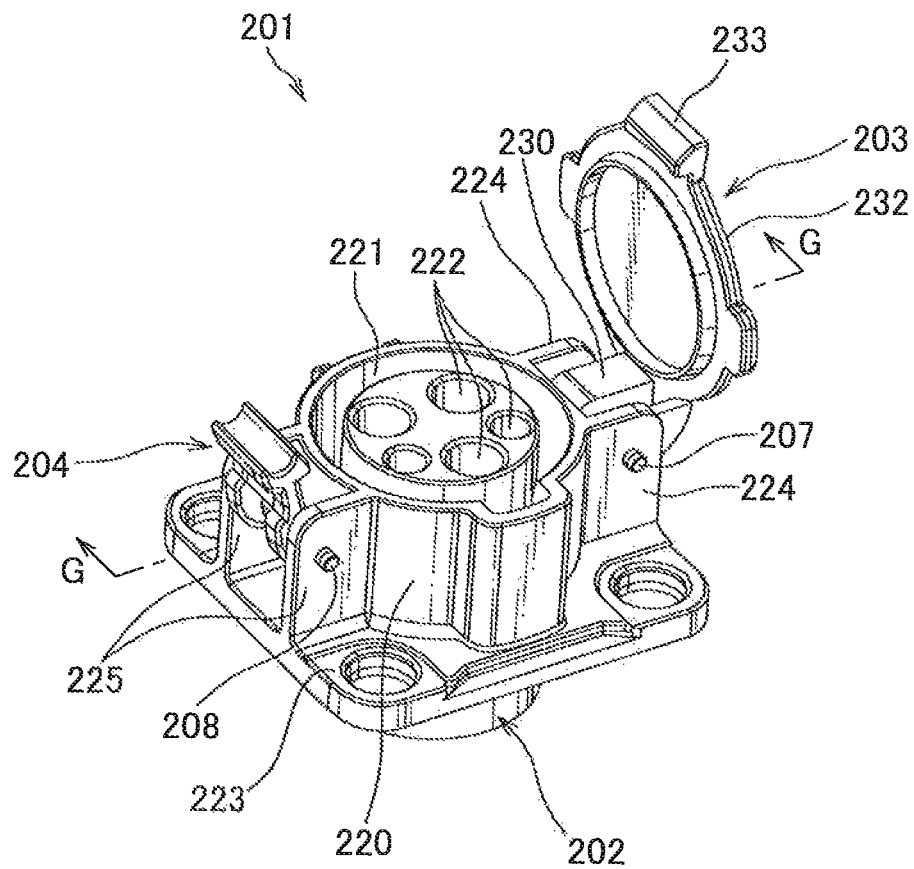


FIG. 6
PRIOR ART



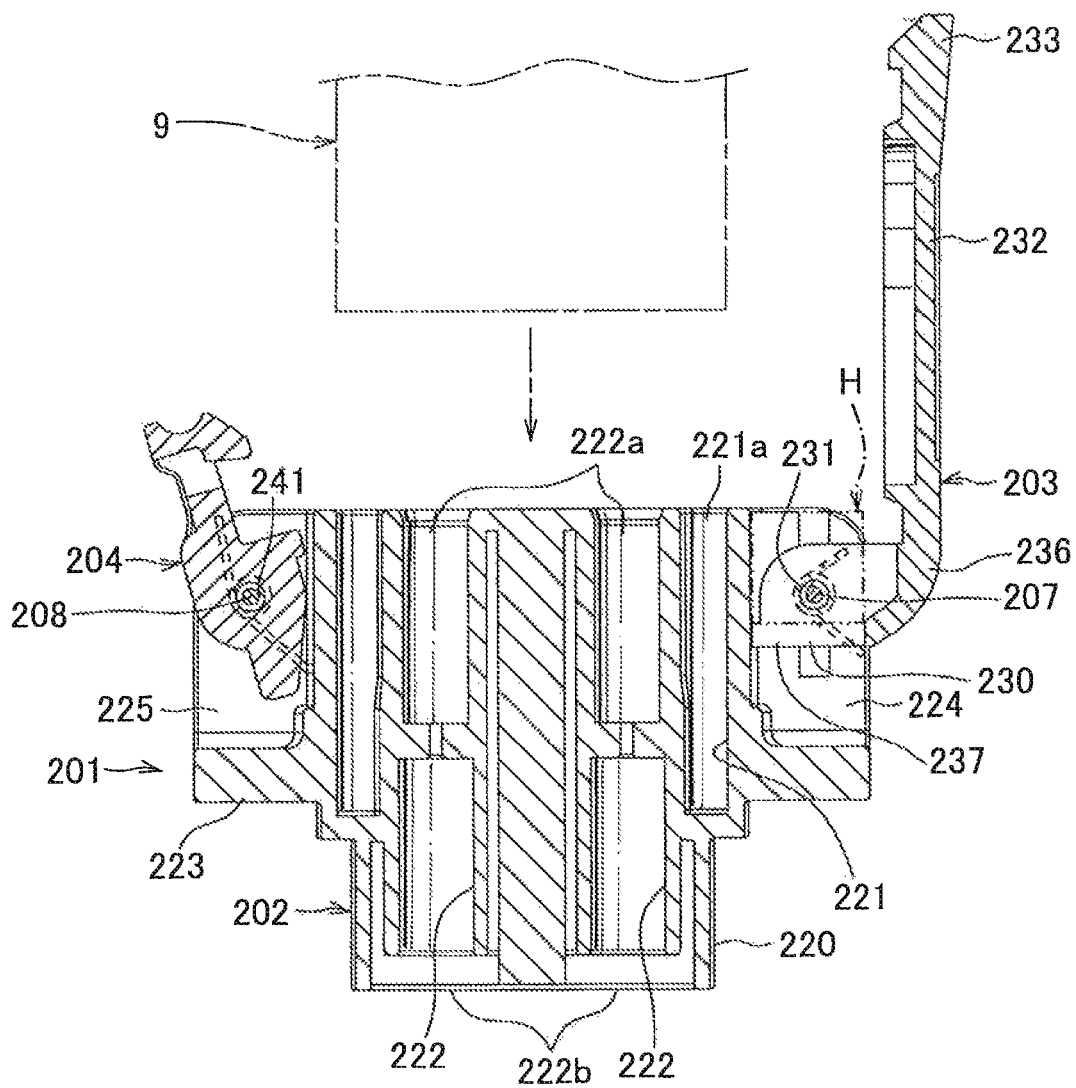


FIG. 8
PRIOR ART

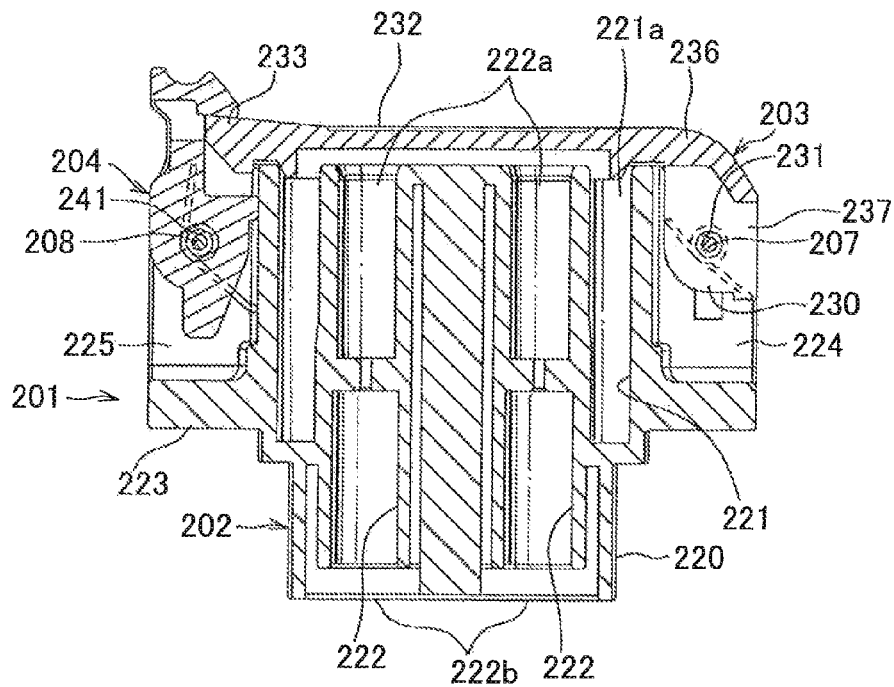
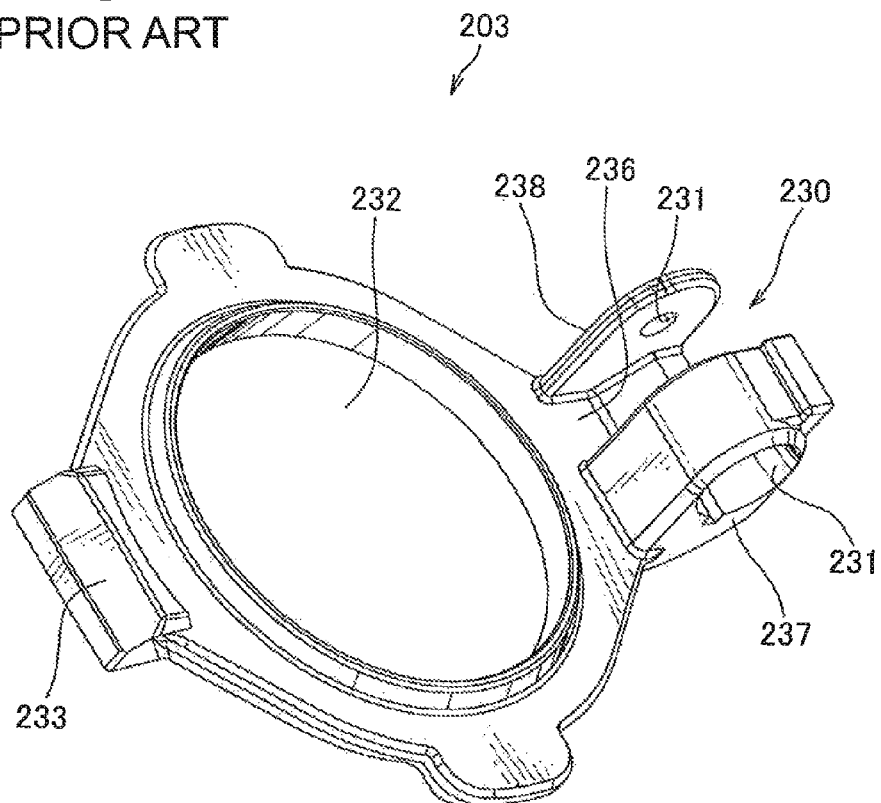


FIG. 9
PRIOR ART



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CONNECTOR

TECHNICAL FIELD

This invention relates to connectors with cover that are 5
connected with connectors such as charge cables.

BACKGROUND ART

A connector **201** shown in FIGS. **6** to **9** have conventionally 10
been used for electric automobile, and is designed to be
connected with a connector **9** of a charge cable for charging a
battery of the automobile (see PTL 1).

The connector **201** is provided with a housing **202**, a cover 15
203 pivoted by the housing **202** and covering openings **221a**,
222a of the housing **202**, a latch **204** pivoted by the housing
202, holding a state that the cover **203** covers the openings
221a, **222a** by it being engaged with an edge **233** of the cover
203 covering the openings **221a**, **222a**, and shafts **207**, **208**.

The housing **202** is made of synthetic resin, and is provided 20
with a housing main body **220**, a flange **223** disposed annually
on an outer peripheral face of the housing **220**, a pair of
attachment plates **224** disposed separated from each other on
the outer peripheral face of the housing main body **220**, to
which the cover **203** is attached, and a pair of attachment 25
plates **225** disposed separated from each other on the outer
peripheral face of the housing main body **220**, to which the
latch **203** is attached. The pair of attachment plates **224** is
provided with axis holes through which the shaft **207** is
passed. The pair of attachment plates **225** is provided with 30
axis holes through which the shaft is passed.

The housing main body **220** is provided with a plurality of
terminal cavities **222**, and a housing cavity **221** receiving a
hood part of the connector **9** of the charge cable. The terminal
cavities **222** extend in a direction engaging with the connector 35
9 of the charge cable, and at an upper end and a lower end of
the housing main body **220** openings **222a**, **222b** are formed.
From the lower opening **222b** a terminal with an electric wire
(not shown) is inserted, and from the upper opening **222a** a
terminal of the connector **9** of the charge cable (not shown) is 40
inserted. These terminal with electric wire and the terminal of
the connector **9** of the charge cable are engaged in the termi-
nal cavity **222**.

The cover **203** is made of synthetic resin, and is provided
with a plate **232** overlaid on the upper end of the housing main 45
body **220**, an edge **233** disposed at an outer edge of the plate
232, and a base **230** disposed at the outer end of the plate **232**
opposite to the edge **233**. The base **230** as shown in FIG. **9** is
provided with an extension part **236** extending from the outer
edge of the plate **232**, and a pair of shaft attachment plates 50
237, **238** extending from the extension part **236** and opposed
to each other. The pair of shaft attachment plates **237**, **238** is
provided with axis holes **231** through which the shaft **207** is
passed.

Furthermore, the pair of shaft attachment plates **237**, **238** is 55
positioned between the pair of attachment plates **224** of the
housing **202**, and by the shaft **207** being passed through the
axis holes **231** of the pair of shaft attachment plates **237**, **238**
and the axis holes of the pair of attachment plates **224**, the
cover **203** is pivoted rotatably by the housing **202**. The cover 60
203, when the connector **9** of the charge cable is plugged into
the housing **202**, opens the openings **221a**, **222a**, and, when
other then charging, covers the openings **221a**, **222a** to pre-
vent water or dirt from entering into the housing **202**.

The latch **204** is made of synthetic resin, and is provided 65
with a shaft **241** through which the shaft **208** is passed. This
latch **204** is positioned between the pair of attachment plates

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225 of the housing **202**, through the shaft holes **241** and shaft
holes of the pair of attachment plates **225** the shaft **208** is
passed, and thus is pivoted rotatably by the housing **202**.

CITATION LIST

Patent Literature

[PTL 1]

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SUMMARY OF INVENTION

Technical Problem

Disadvantageously, in the above-mentioned conventional
connector **201**, there have been following drawbacks.
Namely, one drawback is that in the connector **201**, while the
connector **9** of the charge cable is plugged into the housing **9**
and charge is taken, water or snow accumulating between the
pair of shaft attachment plates **237**, **238** (H portion shown in
FIG. **7**) is such frozen, then ice induced between the pair of
shaft attachment plates **237**, **238** interferences with the cover 25
203 being closed when closing the cover **203** after charge.

Therefore, an object of the invention is to provide a con-
nector in which a cover even if ice is induced between a pair
of shaft attachment plates by such snowfall can readily be
closed. 30

Solution to Problem

In order to achieve the object, there is provided a connector,
including: a housing; a cover rotatably pivoted by the housing
and covering an opening of the housing; a pair of shaft attach-
ment plates disposed in the cover, the pair of plates provided
with an axis hole passing therethrough a shaft; and a peaked
rib disposed between the pair of shaft attachment plates.

Advantageous Effects of Invention

According to the invention, since the pair of shaft attach-
ment plates is disposed in the cover and the peaked rib is
disposed between the pair of shaft attachment plates, it is
made possible that when ice is, with the cover is opened,
induced between the pair of shaft attachment plates by such
snowfall, rotation in a direction closing the cover allows the
ice to be broken, and thus the cover can readily be closed.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view illustrating a connector accord-
ing to one embodiment of the invention;

FIG. **2** is a cross-sectional perspective view taken along
F-F line in FIG. **1**;

FIG. **3** is a cross-sectional view taken along F-F line in FIG.
1;

FIG. **4** is a cross-sectional view illustrating a state that a
cover of the connector shown in FIG. **3** covers an opening of
a housing;

FIG. **5** is a perspective view illustrating a cover of the
connector shown in FIG. **1**;

FIG. **6** is a perspective view illustrating a conventional
connector;

FIG. **7** is a cross-sectional view taken along G-G line
shown in FIG. **6**;

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FIG. 8 is a cross-sectional view illustrating a state that a cover of the connector shown in FIG. 7 covers an opening of a housing; and

FIG. 9 is perspective view illustrating the cover of the housing shown in FIG. 6.

DESCRIPTION OF EMBODIMENTS

With reference now to FIGS. 1 to 5 a “connector” is described related to one embodiment of the invention.

A connector 1 shown in FIGS. 1 to 4 is the one that is mounted to an electric vehicle, and that is connected to a connector 9 of a charge cable (see FIG. 3) for charging a battery of the electric vehicle. The connector 1 is provided with a housing 2, a cover 3 pivoted rotatably by the housing 2 and covering an openings 21a, 22a, a spring 5 biasing the cover 3 in a direction separating from the openings 21a, 22a, a latch 4 pivoted rotatably by the housing 2 and keeping the cover 3 covering the openings 21a, 22a by engaging an edge of the cover with it covering the openings 21a, 22a, a spring 6 biasing the latch 4 in a direction approaching the openings 21a, 22a, and shafts 7, 8.

The housing 2 is made of synthetic resin, and is provided with a housing main body 20, a flange 23 annularly disposed on an outer face of the housing main body 20, a pair of attachment plates 24 disposed separated from each other on the outer face of the housing main body 20, to which the cover 3 is attached, and a pair of attachment plates 25 disposed separated from each other on the outer face of the housing main body 20, to which the latch 4 is attached.

The housing main body 20 is provided with a plurality of terminal cavities 22, and a housing cavity 21 receiving the connector 9 of the charge cable. The terminal cavity 22 extends in an engagement direction of the connector 9 of the charge cable (the arrow E in FIG. 3), and openings 22a, 22b are formed at upper end and lower end of the housing main body 20, respectively. From the lower end 22b a terminal with electric wire (not-shown) is inserted, from the upper opening 22a the terminal of the connector 9 of the charge cable 9 (not shown). These terminal with electric wire and the terminal of the connector 9 of the charge cable are engaged within the terminal cavity 22. The housing cavity 21 is formed so as to be recessed from an upper end of the housing 20, and is formed annular to surround the plurality of terminal cavities 22. The housing cavity 21 has a hood (not shown) of the connector 9 of the charge cable inserted therein.

The upper opening 22a of the terminal cavity 22 and the opening 21a of the housing cavity 21 correspond to “opening” recited in the claims. Namely, the cover 3, when the connector 9 of the charge cable is plugged into the housing 2, opens the openings 21a, 22a, and, excepting charging, covers the openings 21a, 22a so as to prevent water or dirt from entering into the housing 2.

The pair of attachment plates 24 is provided with shaft holes through which the shaft 7 is passed. The pair of attachment plates 25 is provided with shaft holes through which the shaft 8 is passed. These pair of attachment plates 24 and pair of attachment plates 25 are arranged in 180-degree turn across a center of the housing main body 20.

The cover 3 is made of synthetic resin, and is, as shown in FIGS. 4 and 5, provided with a plate 32 overlaid on the upper end of the housing main body 20, an edge 33 disposed an outer edge of the plate 32, and a base 30 disposed at the outer edge of the plate 32 and opposed to the edge 33. The edge 33 as shown in FIG. 4, is positioned outside an outer wall of the housing main body 20. The edge 33 is as mentioned above engaged with the latch 4.

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The base 30 as shown in FIG. 5, is provided with an extension 36 extending from the edge of the plate 32, a pair of shaft attachment plates 37, 38 upstanding from the extension 36 and opposed to each other, and a rib 35 upstanding from the extension 36 and arranged between the pair of shaft attachment plates 37, 38. The pair of shaft attachment plates 37, 38 is provided with shaft holes 31 through which the shaft 7 is passed. The rib 35 extends in a direction perpendicular to a direction in which the pair of shaft attachment plates 37, 38 are opposed to each other, of which a tip separated away from the extension 36 is peaked.

Such the cover 3, by the pair of shaft attachment plates 37, 38 being positioned between the pair of attachment plates 24 and by the shaft 7 being passed through the shaft holes 31 of the pair of shaft attachment plates 37, 38 and the shaft holes of the pair of attachment plates 24, is pivoted rotatably by the housing 2. The arrow A-B in FIG. 3 indicates a rotation direction of the cover 3.

The spring 5 is formed such that a wire is deformed plastically, wound spirally in multiple turns, and provided with a spiral part through which the shaft 7 is passed inside, a base side attachment part disposed at an end of the spiral part and arranged to be attached to the base 30, and a housing side attachment part disposed at the other end of the spiral part and arranged to be attached to the housing 2. The spring 5 biases the cover 3 in the arrow B direction in FIG. 3.

The latch 4 is made of synthetic resin and is provided with a base 40 having a shaft hole 41 through which the shaft 8 is passed, a holding claw 42 projecting from the base 40 and positioned near the outer face of the cover 3 with the openings 21a, 22a being covered, a projection 43 projecting from the base 40 and arranged near the shaft hole 41 more than the holding claw 42. The latch 4 is, by the base 40 being positioned between the pair of attachment plates 25 of the housing 2 and by the shaft 8 being passed through the shaft hole 41 of the base 40 and the shaft holes of the pair of attachment plates 25, pivoted rotatably by the housing 2. The arrow C-D in FIG. 3 indicates a rotation direction of the latch 4. Such the latch 4 as shown in FIG. 4, has the edge 33 of the cover 3 while covering the openings 21a, 22a positioned between the holding claw 42 and the projection 43 so as to be engaged with the edge 33.

The spring 6 is formed such that a wire is deformed plastically, wound spirally in multiple turns, and provided with a spiral part through which the shaft 8 is passed inside, a base side attachment part disposed at an end of the spiral part and arranged to be attached to the base 40, and a housing side attachment part disposed at the other end of the spiral part and arranged to be attached to the housing 2. The spring 6 biases the latch 4 in the arrow C direction in FIG. 3.

Then, a covering procedure of the cover 3 of the connector 1 is discussed. When closing the cover 3 that is now open, the cover 3 is, with the latch 4 rotated in the arrow D direction in FIG. 3 against biasing force of the spring 6, rotated in the arrow A direction in FIG. 3 against biasing force of the spring 5, and the latch 4 is released so that the latch 4 is engaged with the edge 33 of the cover 3. And when opening the cover 3 that is now closed, the latch 4 is rotated in the arrow D direction in FIG. 3 against biasing force of the spring 6. Namely, the latch 4 is released. The cover 3 then opens automatically by biasing force of the spring 5 in the arrow B direction in FIG. 3.

In the aforementioned connector 1, during charging with the connector 9 of the charge cable plugged into the housing 2, water or snow accumulating between the pair of shaft attachment plates 37, 38 (K part in FIG. 1) is frozen, and then ice may be induced between the pair of shaft attachment plates 37, 38. Thereby in the conventional connector there has

been drawback that the cover **3** cannot be closed because of the ice interfering with the cover **3**. On the other hand, in the connector of the present invention, since the peaked rib **35** is disposed between the pair of shaft attachment plates **37**, **38**, when ice, with the cover **3** open is induced between the pair of shaft attachment plates **37**, **38** by snowfall, rotation of the cover **3** in closing direction (the arrow A direction in FIG. **3**) allows the ice to be broken so as to close the cover **3** readily.

Note that the above-mentioned embodiments merely show typical embodiment of the present invention, but the invention is not limited to the embodiments or the modifications. Namely, it is to be understood that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention hereafter defined, they should be construed as being included therein.

REFERENCE SIGNS LIST

- 1** connector
- 2** housing
- 3** cover

- 31** shaft hole
- 21a**, **22a** opening
- 35** rib
- 37**, **38** shaft attachment plate
- The invention claimed is:
 - 1.** A connector, comprising
 - a housing; and
 - a cover supported rotatably and pivotally by the housing and covering an opening of the housing, the cover provided with a plate to be overlaid on an upper end of the housing and a base,
 - wherein the base includes an extension extending from an outer edge of the plate, a pair of shaft attachment plates provided with a shaft hole with a shaft passing there-through, and a rib arranged between the pair of shaft attachment plates and made peaked, the rib upstanding from the extension in a direction perpendicular to a direction in which the pair of shaft attachment plates are opposed to each other.
 - 2.** The connector of claim **1**, wherein the rib is offset from the shaft.

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